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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/643,895	08/20/2003	Yuji Tochio	1344.1122	4672

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EXAMINER	
CURS, NATHAN M	

ART UNIT	PAPER NUMBER
2613	

DATE MAILED: 12/08/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/643,895	TOCHIO ET AL.	
	Examiner	Art Unit	
	Nathan Curs	2613	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *20 August 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-21* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-3,7-10,12-15 and 21* is/are rejected.

7)☒ Claim(s) *4-6,11 and 16-20* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *20 August 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *8/03*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claim 7 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Claim 7 claims that "instead of the digital filter, an analog filter is provided in each of said first and second resonance component removing sections". However, claim 7 depends on claim 6, which depends on claim 3. Claim 3 requires using a digital filter. Therefore, claim 7 contradicts claim 3.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1-3, 8-10, 12-15 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tochio et al. ("Tochio") (US Patent Application Publication No. 2002/0109076) in view of Ghandi et al. ("Ghandi") (US Patent No. 6975785).

Regarding claim 1, Tochio discloses a control apparatus of an optical signal exchanger which includes a first mirror array and a second mirror array, each having a plurality of tilt mirrors arranged on a plane, each tilt mirror having a reflecting surface an angle of which is controllable, and which sequentially reflects an input optical signal by said first and second mirror arrays to output from a specific position (fig. 18 and paragraphs 0135-0137), for detecting power of an optical signal output from said specific position, and feedback controlling the angle of at least one of the reflecting surfaces of the tilt mirrors, which have reflected the optical signal on said first and second mirror arrays, based on the detection result (fig. 19 and paragraphs 0138-148). Tochio's systems is based on MEMS, but Tochio does not disclose that said control apparatus comprises a resonance component removing section that removes a frequency component corresponding to a mechanical resonance action of each said tilt mirror, included in a control signal used for said feedback control, and said resonance component removing section is at least shared corresponding to a pair of driving electrodes arranged in a coaxial direction of said tilt mirror. Ghandi discloses a MEMS-based optical switch where a MEMS device control signal is filtered to remove the first system resonance of the MEMS device (col. 1, lines 14-19, col. 2, line 65 to col. 3, line 30 and col. 21, lines 38-49). It would have been obvious to one of ordinary skill in the art at the time of the invention to apply the teaching of Ghandi to the mirror driving circuits of Tochio, to provide the advantage of optical switching time by compensating for mechanical resonance, as suggested by Ghandi.

Regarding claim 2, the combination of Tochio and Ghandi discloses a control apparatus of an optical signal exchanger according to claim 1, comprising: a first mirror drive section that supplies a voltage to either one of a pair of driving electrodes arranged in a first axial direction of each tilt mirror of said first mirror array (Tochio: fig. 18, element 14a, "X AXIS"), and also supplies a voltage to either one of a pair of driving electrodes arranged in a second direction

different from said first axial direction (Tochio: fig. 18, element 14a, "Y AXIS"), to adjust the angle of the reflecting surface of said tilt mirror; a second mirror drive section that supplies a voltage to either one of a pair of driving electrodes arranged in a first axial direction for each tilt mirror of said second mirror array (Tochio: fig. 18, element 14b, "X AXIS"), and also supplies a voltage to either one of a pair of driving electrodes arranged in a second direction different from said first axial direction (Tochio: fig. 18, element 14b, "Y AXIS"), to adjust the angle of the reflecting surface of said tilt mirror; an optical power detection section that detects power of the optical signal output from said specific position (Tochio: fig. 18, element 12); and a comparison control section that generates a control signal for controlling a driving state of the tilt mirror being an object to be controlled (Tochio: fig. 18, element 13), so that an angular displacement of the reflecting surface of said tilt mirror is corrected according to the optical power detected by said optical power detection section (Tochio: paragraphs 0135-0137), wherein said resonance component removing section includes: a first resonance component removing section that removes said resonance frequency component included in the control signal sent from said comparison control section to said first mirror drive section, by using a band-elimination filter that is at least shared for each of the first axial direction and the second axial direction of said each tilt mirror and a second resonance component removing section that removes said resonance frequency component included in the control signal sent from said comparison control section to said second mirror drive section, by using a band-elimination filter that is at least shared for each of the first axial direction and the second axial direction of said each tilt mirror (Tochio: fig. 19 and Ghandi: col. 21, lines 38-49, as applicable in the combination).

Regarding claim 3, the combination of Tochio and Ghandi discloses a control apparatus of an optical signal exchanger according to claim 2, wherein said optical power detection section outputs an analog signal indicating the detected optical power to said comparison control

section (Tochio: fig. 19, element 12), said comparison control section converts the analog signal from said optical power detection section into a digital signal, and then, according to said digital signal, outputs a digital control signal for controlling the driving state of the tilt mirror being the object to be controlled (Tochio: fig. 19, element 13), to said first and second resonance component removing sections, so that the angular displacement of the reflecting surface of said tilt mirror is corrected, and each of said first and second resonance component removing sections removes said resonance frequency component included in the control signal from said comparison control section by using a digital filter (Ghandi: fig. 6 and col. 21, lines 38-49, as applicable in the combination, where Ghandi is teaching digital filters since they are placed before the D/A converters for the drive electronics.).

Regarding claim 8, the combination of Tochio and Ghandi discloses a control apparatus of an optical signal exchanger according to claim 2, wherein said first resonance component removing section removes said resonance frequency component included in the control signal sent from said comparison control section to said first mirror drive section, and said second resonance component removing section removes said resonance frequency component included in the control signal sent from said comparison control section to said second mirror drive section. The combination as applied to claim 2 does not disclose that said first resonance removing section uses a band-elimination filter that is shared corresponding to all tilt mirrors on said first mirror array or that said second resonance removing section uses a band-elimination filter that is shared corresponding to all tilt mirrors on said second mirror array. However, Tochio discloses an array of MEMS mirrors (paragraphs 0136), which suggests that the array is made of up multiple of the same type of mirror and Ghandi discloses that the purpose of the filter is to remove a resonance corresponding to the mechanical device (col. 21, lines 38-49). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the

invention that the filter could be shared for the control signals for all the mirrors, since the resonance is a characteristic of the mechanical MEMS mirror device and since the resonance for each mirror in an array of alike MEMS mirrors will be essentially the same as the others.

Regarding claim 9, the combination of Tochio and Ghandi discloses a control apparatus of an optical signal exchanger according to claim 1, wherein said resonance component removing section is shared corresponding to a pair of driving electrodes arranged in a first axial direction, for all tilt mirrors on said first and second mirror arrays, and also is shared corresponding to a pair of driving electrodes arranged in a second axial direction different from said first axial direction (Tochio: fig. 19 and Ghandi: col. 21, lines 38-49, as applicable in the combination).

Regarding claim 10, the combination of Tochio and Ghandi discloses a control apparatus of an optical signal exchanger according to claim 1, wherein said resonance component removing section comprises, for each of said shared configurations, a band-elimination filter having elimination bandwidth corresponding to a variation in the resonance frequency of said tilt mirror (Ghandi: col. 21, lines 38-49, where the notch indicates that the filter is a band-elimination filter).

Regarding claims 12, 13 and 14, the combination of Tochio and Ghandi discloses a control apparatus of an optical signal exchanger according to claim 1, wherein said resonance component removing section removes the resonance frequency component included in said control signal, and discloses using a band-elimination filter (Ghandi: col. 21, lines 38-49, where the notch indicates that the filter is a band-elimination filter), but does not specifically disclose using a band-elimination filter of Butterworth, Chebyshev or elliptic type. The office takes official notice that Butterworth, Chebyshev or elliptic based filter designs are well known in the art for achieving notch filters. Therefore, it would have been obvious to one of ordinary skill in the art

at the time of the invention to use Butterworth, Chebyshev or elliptic based filter designs as an engineering design choice in implementing the notch filter already disclosed by Ghandi. The type of filter design claimed merely amounts to the selection of expedients known as design choices to one of ordinary skill in the art.

Regarding claim 15, the combination of Tochio and Ghandi discloses a control apparatus of an optical signal exchanger according to claim 1, wherein said resonance component removing section removes the resonance frequency component included in said control signal, by using a low-pass filter having a cutoff frequency corresponding to the resonance frequency of said tilt mirror (Ghandi: col. 21, lines 38-49, as applicable in the combination).

Regarding claim 21, Tochio discloses a control method of an optical signal exchanger which includes a first mirror array and a second mirror array, each having a plurality of tilt mirrors arranged on a plane, each tilt mirror having a reflecting surface an angle of which is controllable, and which sequentially reflects an input optical signal by said first and second mirror arrays to output from a specific position (fig. 18 and paragraphs 0135-0137), for detecting power of an optical signal output from said specific position, and feedback controlling the angle of at least one of the reflecting surfaces of the tilt mirrors, which have reflected the optical signal on said first and second mirror arrays, based on the detection result (fig. 19 and paragraphs 0138-148). Tochio's method is based on MEMS, but Tochio does not disclose that a frequency component corresponding to a mechanical resonance action of each said tilt mirror, included in a control signal used for said feedback control, is removed at least commonly corresponding to a pair of driving electrodes arranged in a coaxial direction of said tilt mirror. However, it would have been obvious to one of ordinary skill in the art at the time of the invention to combine Berhane with Tochio as described above for claim 1.

Allowable Subject Matter

5. Claims 4-6, 11 and 16-20 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

6. The following is a statement of reasons for the indication of allowable subject matter: Prior art could not be found that read on the specific structure of the resonance removing section and comparison control section claimed in dependent claims 4-7, 11 and 16-20.

Conclusion

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

- US Patent Application Publication No. 2002/0171902 – discloses using a digital filter to compensate for resonance of a MEMS electro-optic device.

8. Any inquiry concerning this communication from the examiner should be directed to N. Curs whose telephone number is (571) 272-3028. The examiner can normally be reached on M-F (from 9 AM to 5 PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jason Chan, can be reached at (571) 272-3022. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (800) 786-9199.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pairdirect.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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